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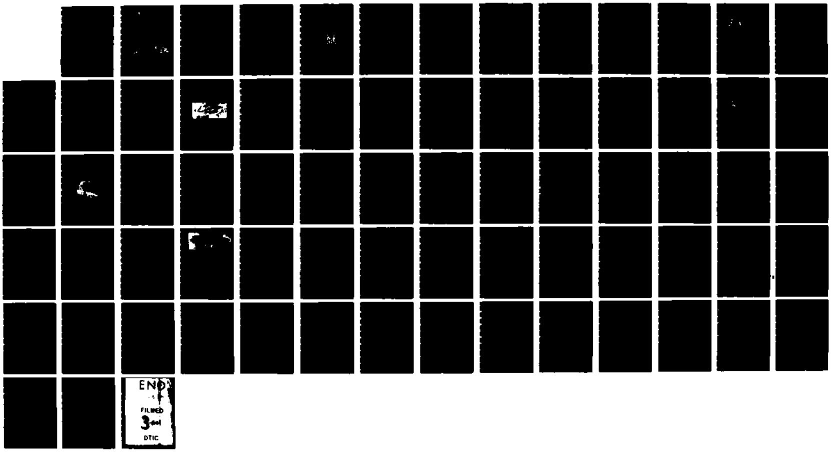

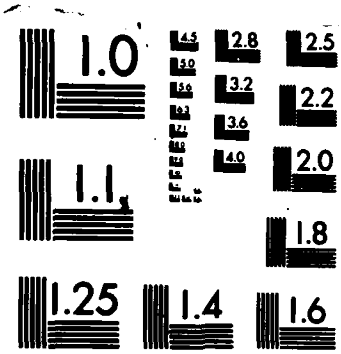
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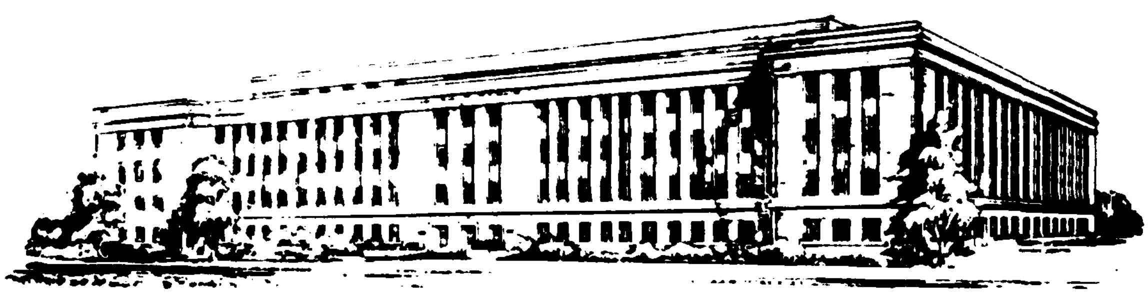
TACTICAL AIR RECONNAISSANCE POD SYSTEM. A CASE STUDY



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THE INDUSTRIAL COLLEGE OF THE ARMED FORCES
NATIONAL DEFENSE UNIVERSITY

MOBILIZATION STUDIES PROGRAM REPORT

TACTICAL AIR RECONNAISSANCE POD SYSTEM
A CASE STUDY

by

THOMAS A. MYERS, CAPT, USN

A-1

A RESEARCH REPORT SUBMITTED TO THE FACULTY
IN FULFILLMENT OF THE RESEARCH REQUIREMENT

RESEARCH SUPERVISOR: DR. B. WATERMAN

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

MARCH 1983

DISCLAIMER-ABSTAINER

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TACTICAL AIR RECONNAISSANCE POD SYSTEM

A CASE STUDY

I. INTRODUCTION

A. History

1. In August 1981, the Navy deployed the first F14 fighter squadron (VF-84) equipped with three Tactical Air Reconnaissance Pod Systems (TARPS) for targeting and intelligence support of the Battle Group Commander. This TARPS deployment is the first tactical reconnaissance imaging platform to be introduced into the fleet since the early 1960's when the RA5C and RF8 aircraft were first deployed in fleet operations as the Navy's carrier-based tactical reconnaissance squadrons. ~~The~~ replacement of the previous RA5C and RF8G reconnaissance-dedicated aircraft by the F14/TARPS combination now provides a multimission fully capable fighter/recce aircraft.

2. The development and acquisition process of TARPS was one that required flexibility in management, tenacity of purpose and a dedication to the tactical mission needs. The history of development includes changes in mission requirements, aircraft type, available funding, deployment concept, and production and deployment schedules, as well as

a change from an interim system to a now planned ~~ten~~ to twelve year minimum life system. As a case study of the acquisition process, TARPS is unique in that it succeeded in surviving enough pitfalls, undesired direction and delays for three separate procurement efforts. The tenacity in the development process continues to be proven worth the effort in the continuing highly successful deployments that the TARPS system has enjoyed since fleet introduction.

II. RESEARCH AND DEVELOPMENT

A. Concept Validation Phase

1. General

a. In late 1973 the Naval Air Development Center (NADC) was tasked by the Naval Air Systems Command (AIRTASK A510-510E/001-D/4W3679-0000) to validate the concept experimentally and define the specification for a tactical airborne reconnaissance pod system. This task required NADC to construct an optical reconnaissance pod for carriage on an A7C/E light attack aircraft, design and install the pod and the aircraft interface equipment, and flight test the system in an operational environment.

b. The purpose of the flight test was to verify component operation and data annotation accuracy, evaluate various sensor performances, and demonstrate capability of the A7 mounted pod to perform the tactical reconnaissance mission.

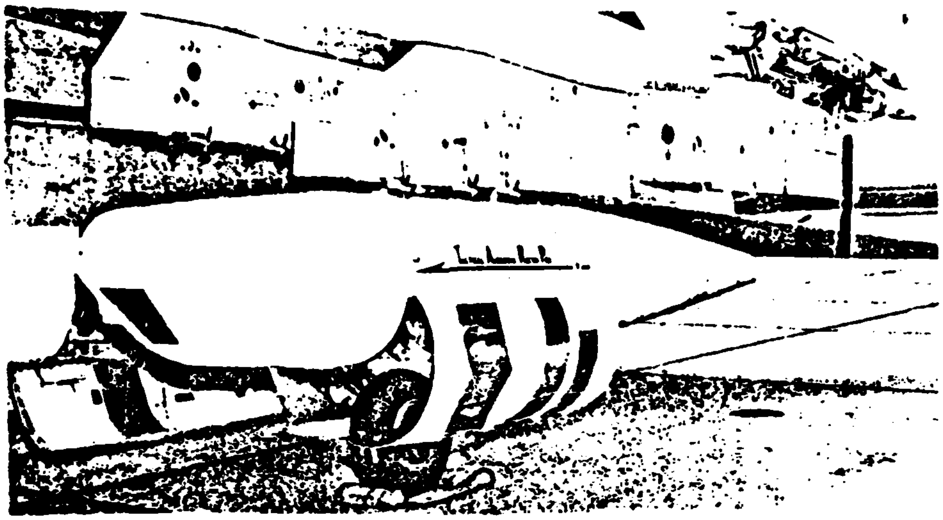


Figure 1. TARPS validation model on A7C aircraft.

2. System Design

a. Pod. The reconnaissance pod for this validation was a modified Sargent-Fletcher 300 gallon fuel tank certified for subsonic carriage on the A7D aircraft. The center section was fitted with app ɔpriate camera windows and a hinged door with removable sections for rapid access to a proposed variety of test sensors. The pod incorporated a six-inch forward oblique camera in the nose section, a six-inch vertical camera, and a data annotation and camera control system in the aft section. In addition, the center section could accept a nine-inch panoramic camera or the AAD-5 infrared set for various mission image comparisons. Numerous other junction boxes and master connectors were incorporated tc allow for interchangeability of test sensors into this original TARPS prototype.

b. Sensors

1. KS-87B. The Chicago Aerial Industries KS-87B is a commonly used serial frame camera in the Air Force and the Marine Corps and was selected for use in the forward oblique and vertical sensor positions. This camera offered off-the-shelf availability, good reliability and a variety of lens cone lengths without refocusing the sensor.

(2) KA-99. The Fairchild KA-99 is a nine-inch focal length panoramic camera which was developed specifically for testing in TARPS as a low-to-medium altitude multipurpose sensor. The most valuable characteristic of the KA-99 is the 180^{o} horizon to horizon coverage at low altitudes and high speeds (500 feet and 500 knots).

(3) KA-56. The Chicago Aerial KA-56 is a three-inch panoramic camera designed for low altitude, high speed missions and was used during the carrier structural testing and carrier operational demonstration. This sensor was utilized because of its availability in the Navy inventory as well as compact size, allowing dual sensor configuration testing in the pod's center bay section.

(4) KA-93. The KA-93 is a medium standoff range 24-inch focal length Chicago Aerial panoramic camera used to demonstrate the sensor stability and associated resolution of a long focal length lens in a wing mounted podded system.

(5) AN/AAD-5. The Honeywell AAD-5 is a high resolution, day or night infrared line scanning system which was utilized by the Air Force in the tactical reconnaissance RF4C and subsequently used with the Marine Corps RF4B reconnaissance aircraft. This highly reliable sensor has two fields of view (wide and narrow) and a long mission film capacity, and provides the only night-capable sensor in the TARPS configuration.

(6) Other Sensors. Other sensors were utilized in various limited testing of TARPS (HS-401 and Reconofax XIIIA) but were not incorporated in the final configuration of the Engineering Development Model. A COHU 4510-012 television camera (10mm lens) and an Ampex Video Recorder were installed for several flights as a potential viewfinder for cockpit display. The inflight image of either vertical or 30° forward looking depression was displayed in existing A7C Walleye Sonyscope equipment.

c. Nonsensor Equipment

(1) Data Display/Camera Control System (DD/CCS). This DD/CCS selected for the TARPS validation phase was a McDonnell AN/ASQ-154, a system originally developed for the Air Force RF4C. This system is a solid state film annotation system that imprints a binary or alphanumeric data code on each film frame. This code contains various mission and navigational data appropriate to each frame of photography for post mission analysis.

(2) Heaters. A series of three air heaters, temperature controllers and blowers were installed in the TARPS demonstration model. This controlled system provides for a stable temperature and humidity sensor environment, ensuring condensation-free optical ports, camera film, and electronic equipment throughout rapid altitude changes inherent in a tactical mission profile.

(3) Manual Controls. The pilot's cockpit control box for sensor control was installed on the right hand console of the test A7 aircraft and provided separate select switches for each sensor, overexposure selection, operate and fail lights and the necessary film-remaining counters.

(4) Automatic Controls. Additional controls for TARPS operation were incorporated into the A7 weapon system navigation computer AN/ASN-91. This modification to the operational flight program (OFP) was accomplished by Naval Weapons Center, China Lake, and retained all of the standard A7 weapons delivery functions. With the pilot entering the target location altitude and length into the computer, the operational flight program then provided a heads-up display to the pilot in terms of target steering and miles to go, and automatically turned on and off the selected sensors with sufficient timing to ensure target coverage. The OFP also feeds the DD/CCS annotation system with current navigational and aircraft special data for film recording.

3. Concept Results

a. The results of the flight testing program sucessfully demonstrated that high quality reconnaissance imagery could be obtained from a pod mounted system on the A7C/E aircraft. Additionally, the basic flying qualities of the TARPS/A7 aircraft combination are essentially unchanged from the basic attack-configured aircraft.

b. The TARPS sensor evaluation for flight deck operations, routine service and maintainability support revealed numerous Navy-peculiar obstacles to rapid turnaround of the entire sensor system. Handling equipment, film loading in salt air flight deck conditions, and liquid nitrogen safety concerns were evaluated and provided data for future modifications. Similarly pilot operating procedures were adjusted, changed, and designated for design modification in the follow-on Engineering Model fabrication.

c. The single aerodynamic problem that affected all sensors tested was a reduction in the quality of demonstrated resolution at speeds in excess of 460 knots. This structural vibration problem was a major concern in the future design of a podded system and its proposed carriage on any standard sized weapons station. In an effort to expand the data base on vibration levels of supersonic-designed podded systems the Navy attempted an additional series of tests of a modified Grumman Aerospace F14 fuel tank. The F14 pod structure was modified to carry the Fairchild KA-77 panoramic sensor and was flown on several A7

reconnaissance flights. Because of sensor internal malfunctions, the resultant film could not be analyzed accurately. The feasibility of this additional pod interface with the aircraft was demonstrated but no attempt was made to evaluate the serviceability or operational value. Further testing was recommended if any consideration were to be given to use of a nacelle tank designed for the F14. However, no further work with that configuration followed the limited number of flights.

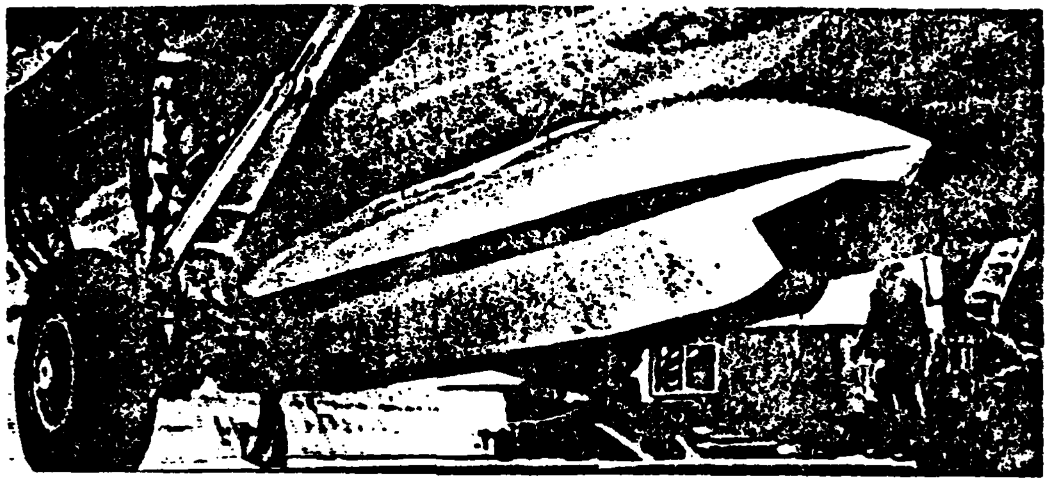


Figure 2. Modified Grumman Aerospace F14 fuel tank pod.

4. Concept Recommendation

a. The completion of the feasibility demonstration and the successful operation of TARPS suggested further development of a pod mounted system for fleet utilization. The recommended system was to include a TV viewfinder, forward oblique sensor, high-to-low-altitude panoramic sensor, infrared line scanner and vertical framing camera. The pod design would also stress ease of accessibility for maintenance

and servicing, with consideration given to vibration and shock isolation for an improvement in sensor resolution performance.

5. Program Documentation Development

a. Operational Requirement

(1) Upon completion of the demonstration of the TARPS feasibility pod, the Navy issued the first Operational Requirement Document (W02TW) entitled "Follow-on Tactical Air Reconnaissance System". This document addressed the operational deficiency in the current tactical reconnaissance systems and the replacement of these assets with an A7E and F14 podded system to provide the flexibility to meet the threat.

(2) The operating concept was to provide the traditional roles of tactical imagery support to the Battle Group Commander for target identification and surveillance, battle assessment and map supplementation. In addition, the aircraft capable of the reconnaissance mission was to have only a minimal modification and no permanent degradation of the attack or fighter mission capability.

(3) The tactical reconnaissance capabilities that were originally stated in the Operational Requirement included an optical day sensor, an infrared system, and an all-weather radar system. Additional growth potential for future sensors not yet mature enough for

engineering development was to be built into the pod from the initial design.

(4) The sensor package was to have a forward looking serial frame camera with a choice of preselected lens sizes and was to contain an all-purpose panoramic camera to perform throughout the altitude envelope of the aircraft. An infrared line scanner system and a night photographic camera with covert target illumination integral to the camera was required for the night mission. The additional development of an all-weather radar sensor was to be in a separate podded system.

(5) The engineering design was to include general features, which had been determined during the original TARPS/A7 feasibility demonstration flights. They were:

- Modularized sensors and sensor bays for easy access and reconfiguration.
- Supersonic pod capable of carriage on A7 or F14 aircraft.
- Maximum weight of 1200 pounds, so as not to restrict aircraft performance.
- Built-in test features for rapid servicing.
- Minimum aircraft modifications.
- Self-contained environmental control system.
- Maximum use of off-the-shelf sensors.
- No requirement for sensor preconditioning.

- o Minimum control displays without viewfinders.
- o Adequate growth capability for Forward Looking Infrared (FLIR) recording, extended side looking radar and advanced electro-optical day or night sensor with real-time cockpit display.

(6) This original Operational Requirement estimated that 72 optical pods and 36 all-weather pods could be designed to cost for approximately $20 million in research and development and $108 million in procurement over a five year program.

(7) In December 1975, the Follow-on Tactical Air Reconnaissance System Operational Requirement was reviewed by the Naval Air Systems Command, which recommended that satisfaction of the requirement not be attempted with a podded system. The review declared that podded systems impose technological and operational considerations which make its development and support difficult and risky. It was stated that an internal or palletized system of a dedicated reconnaissance aircraft would be more practical. The dual mission and aircraft capability were perceived as not cost effective, compromising the design, adding cost, risk, and time, and a training burden.

(8) The review cited the future Naval Aviation Plan listing of an RF18 for future development for this purpose and proposed a true interim measure to reduce the requirements. The proposal continued to recommend a minimum capability only on the A7 with sensor

technology development to be directly transferable to the RF18. The funding profile was now proposed to be $9 to 12 million for research and development, and $85.9 million for production of 72 systems (constant 1977 dollars).

b. Development Proposal

(1) Following the establishment of the operational need for the A7 and F14 role in tactical reconnaissance, the Development Proposal (DP) was published in March 1976, further defining the program requirements and objectives.

(2) This document recommended a two-phased approach to satisfy the requirements. The first phase was to develop a subsonic optical day and night sensor pod to be used exclusively by the A7E aircraft during the interim period. The second phase was to develop an advanced electro-optical system and an all-weather sensor capable of modularization for carriage on a dedicated RF18.

(3) The two-phased approach to the selection of a future tactical reconnaissance platform was based on the perceived risk and cost of a universal pod development capable of high quality imagery at supersonic flight and the Naval Aviation Plan choice of a dedicated RF18 aircraft in FY84.

(4) The need for advanced sensors to be flexible and

compatible with the next generation reconnaissance platforms was continually stressed. The interface of Remotely Piloted Vehicles (RPV) with the A7 for a reconnaissance mission was not recommended because of serious technical problems related to dual mission capability. Continued concern was expressed over the use of a podded system aboard a carrier and the perceived poor maintainability and handling problems associated with a large pod.

(5) The basic sensor performance requirements that were stated in the Development Proposal were almost identical to those listed in the Operational Requirement. The following is a list of the developmental alternatives that were proposed:

- Universal Pod for Primary Capability--one pod for the F14 and A7E capable of supersonic optical and all-weather missions.

- Two Pods for Primary Capability--separate pods for the A7E and F14. The A7 to carry the subsonic optical and all-weather pod; the F14 to carry the supersonic optical system.

- One Pod for Interim Capability, RF18 for Primary Capability--an interim subsonic

A7E podded system with limited day and night sensors and a supersonic fully capable RF18 advanced system.

- One Pod for Interim Capability with A7E and F14 Interface, RF18 for Primary Capability--an interim pod capability for A7E and F14 with limited optical day and night sensor with full supersonically capable RF18 advanced system.

(6) In the evaluation of the above alternatives, the logistic impacts of using existing U.S. and foreign sensors were considered. The Development Proposal thus recommended that the more cost effective and superior performance system would be one pod for interim capability and the advanced RF18 system for the future all-weather sensor. This proposal suggested that an interim A7 system could be operational in 1979 and an F14 if required in 1980.

(7) The operational organization concept listed numerous base loading options with their advantages and drawbacks. However, each option contained a parent squadron concept with small detachments deploying with each Carrier Air Wing.

(8) The evaluation of the cost comparison of the alternatives suggested that the program be pursued as an exception to the design-to-cost requirements. This recommendation was based on the fact that the program required the earliest fleet introduction and that the Operational Requirement specifies sensor performance characteristics in detail. Therefore, the design-to-cost requirement was not imposed, but a Program of Acquisition Cost Control was established with a $1 million per pod cost goal.

(9) The technical risks of the required sensors and pod in the engineering model phase were identified in the area of the advance sensors development and the vibration level of a supersonic pod development. Continued emphasis on a strong reliability and maintainability program was proposed and considered as a certain degree of program risk. The financial risk of the program was evaluated as low because of the validation phase data, and medium for the development of a supersonic pod. The schedule risk was considered low to medium. However, it was recognized that the integration of production schedules of six commerical companies, five Navy facilities and the Air Force would be required to manage the TARPS program. Other risks of shipboard compatibility and support equipment development were addressed but no specific risk was assessed.

6. Program Guidance Changes

a. From the funding approval by Congress in 1973 of the TARPS

concept validation phase, through the issuing of the Operational Requirement and the Development Proposal documents, the program has focused on a podded system development on a dedicated A7 aircraft operating as a stand-alone command capability. In January 1976, direction was given to the Naval Air Development Center to begin the follow-on design of six TARPS Engineering Development Models (EDM) for further program development testing on the A7 aircraft.

b. In the spring of 1976, Congress deleted the funds for the future development of an all-weather standoff radar system that was to be used in a separate pod on the A7 or as a sensor for the future RF18 platform.

c. In February 1976, Chief of Naval Operations (CNO) staff directed that 52 TARPS systems be built (later changed to 48) with no TV viewfinder to be incorporated.

d. In March 1976, CNO instituted a study of the use of the Swedish "Star Baron" reconnaissance podded systems as a potential Navy tactical reconnaissance system in lieu of TARPS production. The CNO report, completed April 1977, concluded that the Star Baron pod was less capable, would provide only a minor cost savings and would cause a severe schedule delay.

e. In September 1976, CNO guidance (message CNO 232054Z Sept 76) to the Naval Material Command reflected the Department of Defense

(DOD) direction that TARPS was to be carried only on the F14 aircraft. The concept of fleet operations remained a dedicated aircraft in a dedicated reconnaissance community.

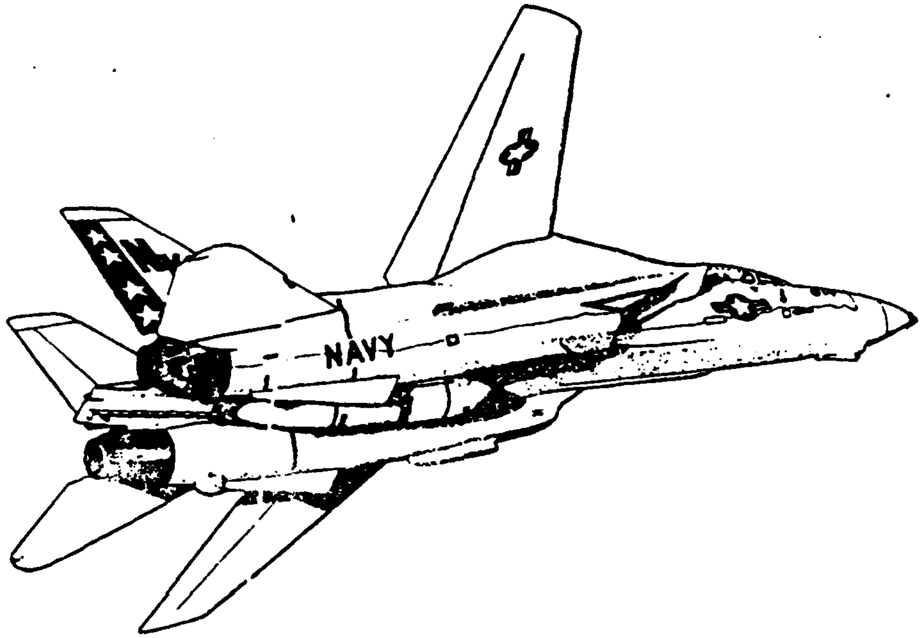


Figure 3. Drawing of TARPS pod on F14 aircraft.

B. Engineering Development Model

1. General

a. The final F14/TARPS Engineering Development configuration design was similar only in concept to the initial A7 prototype. The EDM was 17 feet long, increased in weight to 1750 pounds, designed for supersonic flight, and carried only three sensors and their control equipments. These sensors included a two-position inflight rotatable

KS-87B six-inch focal length framing camera (forward oblique and vertical), a KA-99A nine-inch focal length panoramic sensor for low to medium altitude high speed photography and an AN/AAD-5 infrared low level, day and night system. The pod also contained the computerized control and power distribution units for film annotation (ASQ-172), fault isolation (C-10491A), and aircraft system interface.

b. The Naval Air Systems Command contracted with the Naval Air Development Center for the development and fabrication of six TARPS engineering development models. After three EDM pods were assembled, in-house problems with the fabrication required reassignment of the pod assembly and integration to the Naval Avionics Center, Indianapolis, Indiana. This transfer of material and expertise resulted in a ten week delay in the program development schedule.

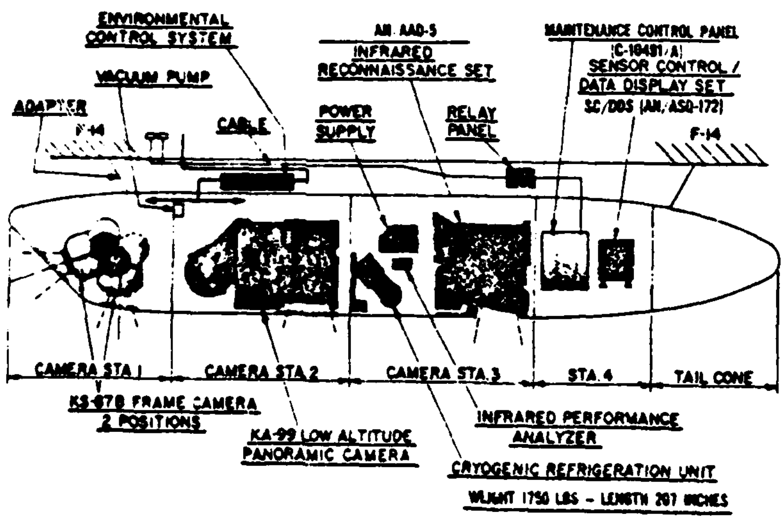


Figure 4. TARPS Engineering Development Model configuration.

2. Test and Evaluation

a. General. The objectives of the EDM evaluation were to provide the highest confidence level for a production approval decision. The test and evaluation (T&E) program included 252 flight hours of performance testing and 140 hours of system integration ground testing for reliability and maintainability. As a result of the TARPS EDM testing, many design tradeoff studies were effectively used in the development of the final production configuration. Some equipments were already in production or off-the-shelf equipment, such as the KS-87 and AAD-5, and had to be accepted as Government Furnished Equipment (GFE) with very few changes possible. The following test facilities were used in various significant evaluation phases of TARPS:

- Naval Air Development Center
- Naval Air Test Center
- Pacific Missile Test Center
- Grumman Aerospace Corporation
- Air Test and Evaluation Force
- Air Test and Evaluation Squadron Four
- Naval Board of Inspection and Survey

b. Developmental Test and Evaluation (DT&E)

(1) General

(a) This phase of EDM developmental testing demonstrated the specific inflight performance characteristics of each sensor over detailed resolution targets. Included in this testing was the in-depth analysis of all equipment malfunctions, failures and resultant system reliability.

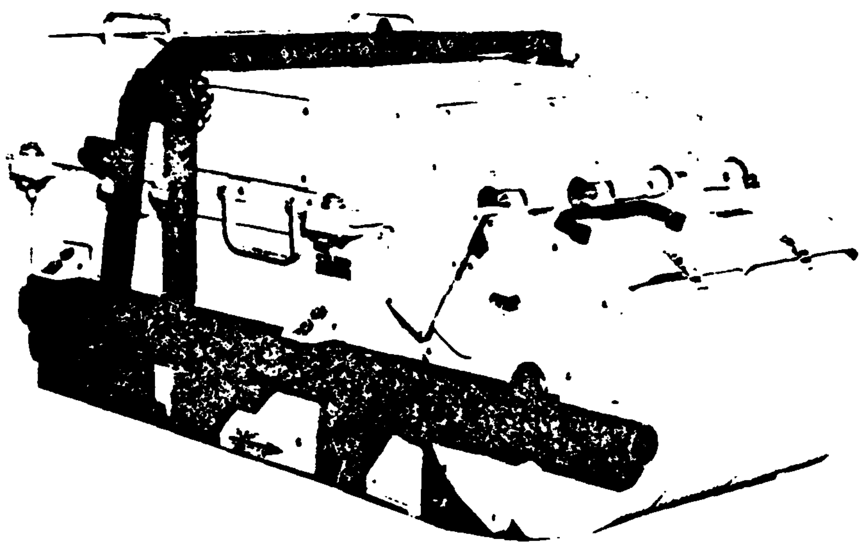


Figure 5. Fairchild KA-99 panoramic camera.

(b) These phases of combined ground and flight testing included the following specific evaluations:

- o Navy Technical Assessment (NTA)

- Navy Development Test (NDT)
- Contractor Test and Evaluation (CTE)
- Operational Flight Program (OFP) Verification
- Integration Test and Evaluation (ITE)
- Technical Evaluation (TECHEVAL)
- Board of Inspection and Survey (BIS)
- I-Level Maintenance Support (DT-IV)

(2) Navy Technical Assessment (NTA). This series of tests, which commenced in July 1977, utilized a mass equivalent pod with two operating sensors instrumented for in-flight vibration levels and were conducted to identify gross deficiencies, establish a safe flight envelope, and assess shock wave problems. The thirteen flights (20.1 hours total) were completed without any adverse test results or significant failures.

(3) Navy Development Test (NDT). These developmental ground evaluation and acceptance test flights in December 1977 allowed for early assessment of sensor resolution, reliability, and maintainability demonstrations. The flight testing was successfully completed in five flights (6.5 hours total) at the Naval Air Test Center (NATC).

(4) Contractor Test and Evaluation (CTE). This phase of contractor evaluation included the System Integration Testing (SIT) and flight testing necessary to evaluate the design and operation of the

TARPS-peculiar F14 weapon systems software. A total of thirteen flights (25.2 hours total) and 700 hours of ground testing completed the cockpit control panel and power distribution evaluation, and the initial analysis of the effect of a full Environmental Control System (ECS) for sensor conditioning.

(5) Operational Flight Program (OFP) Verification. These tests conducted by the Pacific Missile Test Center (PMTC) consisted of four flights (7.8 hours total) and 37 hours of ground usage which confirmed that the safety of flight and software package was ready for mission evaluation in an operational environment.

(6) Integration Test and Evaluation (ITE). Eleven flights (17.4 hours total) were flown by NATC in support of this reliability and maintainability evaluation. The technical inconsistencies of sensor resolution during these flights resulted in a program manager's decision to delay the beginning of TECHEVAL. The ITE was expanded in scope to provide more data for Navy evaluation of the inconsistencies.

(7) Technical Evaluation (TECHEVAL). The TECHEVAL consisted of 35 flights (70 hours total) and 160 ground test hours and included full system testing of sensors, controls, and flight-crew work load analysis as well as carrier suitability, mission potential, and support equipment verification. Logistic support in training and maintenance equipments were also evaluated during this phase.

(8) Board of Inspection and Survey (BIS). The Board of Inspection and Survey which held acceptance trials at the same time as the TECHEVAL, was responsible for the technical suitability of the TARPS to perform the mission. The BIS trials results were the same as that of the TECHEVAL, however, the final report with recommendations was forwarded directly to the Secretary of the Navy. The TARPS BIS trials (project number 21317) consisted of approximately 35 flights and were begun in November 1978 and completed in April 1979.

(9) Intermediate Level Maintenance Support (DT-IV). Included in this phase of testing was the in-depth analysis of all equipment malfunctions, their mean time between failures and the necessary corrective actions or redesign recommendation. This data was measured against the reliability requirements for each sensor and the F14 aircraft and TARPS system as a total system.

c. Operational Test and Evaluation (OT&E)

(1) General. These evaluations of the TARPS total program development were in support of a limited production decision at Milestone IIIA (OT-IIIA) and a full production decision after successful completion of Operational Evaluation (OPEVAL) at Milestone IIIB.

(2) OT-IIIA. The specific full-system operational evaluation objectives are 1) preliminary evaluation of mission effectiveness; 2) TARPS reliability in meeting the published thresholds

of performance in an operational environment; 3) capability of fleet personnel to support TARPS; 4) establishment of flight crew training requirements; 5) demonstration of TARPS capability to execute reconnaissance mission; 6) assessment of F14/TARPS survivability and vulnerability in a hostile environment and development of tactics; 7) and determination of fleet compatibility and logistic supportability of TARPS. This evaluation was successfully completed in July 1979 and resulted in a positive recommendation for a Provisional Approval for Service Use (PASU) and a limited production of 24 pods.

(3) OT-IIIB (OPEVAL). Operational Test and Evaluation Squadron Four (VX-4) successfully completed TARPS OPEVAL in November 1980 and recommended an Approval for Service Use (ASU) in support of a full production decision. Several improvements in the performance of the TARPS pod and the TARPS-configured F14 aircraft were recommended for future funding and development. These tests emphasized the full system performance and the Intermediate Level (I-Level) ground support equipment. Representative tactical targets were used in simulated enemy actions. The reconnaissance mission results were processed simulating combat urgency demands and all flights were supported by fleet maintenance personnel.

3. Program Documentation Development

a. Navy Training Plan (NTP)

(1) In October 1976, the initial development of the F14-TARPS Navy Training Plan (NTP A-50-7701C) began with a functional system description, operational uses, maintenance and support concepts, and personnel manning levels.

(2) Numerous manning level conferences were held during the NTP development to determine the skills and necessary experience levels of the personnel for the TARPS organizations. The personnel manning level figures varied from 15 to 150 additional personnel dependent upon the development of a fold-in concept to an existing squadron, an add-on to an existing squardon, or a stand-alone command.

(3) In October 1979, the NTP was modified to reflect the TARPS organization as a fold-in concept to an existing F14 fighter squadron. Three aircraft in the TARPS fighter squadron were assigned additional mission capabilities of TARPS and 16 (later changed to 18) TARPS-peculiar maintenance personnel were added to the command structure. These addditional 18 enlisted personnel included intelligence specialists, intermediate level trained sensor repair personnel, photographic mates and non-rated personnel.

(4) The requirement of four formally trained F14 flight

crews was established in each reconnaissance command. These commands assumed an additional primary mission of tactical reconnaissance as well as fleet air defense.

(5) The initial NTP and subsequent update modifications published the schedule of training facility and TARPS maintenance course activation. In early 1979, the NTP was updated to reflect the addition of NAS Oceana as a flight crew and Organizational Level (O-Level) training site for east coast F14 commands. As a cost reduction effort, all enlisted I-Level maintenance training was retained at NAS Miramar.

b. <u>Integrated Logistics Support Plan (ILSP)</u>

(1) In August 1977, the ILSP was assembled to document the collective facts, decisions and assumptions that needed to be implemented to support TARPS development and fleet deployment.

(2) Management policies were established in which EDM and production hardware procurements were accomplished through Naval Air Systems Command contracts with individual sensor manufacturers. The material was delivered as Government Furnished Equipment (GFE) to the Naval Avionics Center for integration, checkout, and final assembly into the pod structure. Once assembled, the pod was shipped to the designated commands with an initial support package of spares and ground support equipments. Each of the carrier maintenance facilities was modified for TARPS and test equipments were installed prior to the

deployment of the assigned TARPS equipped squadrons.

(3) The TARPS design and maintenance support concept was developed in three levels of increasing complexity of repair (O-Level, I-Level, and depot). The O-Level Maintenance Plans were based on a high degree of Built-In-Test (BIT) capability that identified defective Weapons Replaceable Assemblies (WRA's) without external test equipment. WRA's were removed at the O-Level and transported for analysis and disposition at the I-Level repair facility. Equipments that were beyond I-Level repair were shipped to the designated depot level for further maintenance or disposition.

(4) A maintenance plan analysis was conducted which included a Level of Repair Analysis (LORA). This document assigned the repair responsibility of each major sensor and support equipment subassembly.

(5) The ILSP identified the numerous requirements for technical manuals which addressed system operation, troubleshooting, maintenance, parts breakdown listings, checklists, servicing instructions and product analysis for all sensors and support items.

(6) Specific requirements and information regarding the Packaging, Handling, Storage and Transportation (PHST) of the pod, sensors and ancillary equipment in reuseable containers was included in the ILSP. These requirements supported the transfer of equipment from a

work center to the flightline and the logistic transfer between the carrier and the depot supply or repair facility.

(7) The ILSP established future data collection requirements and responsibilities for support, engineering modifications, and configuration control management.

c. Navy Decision Coordinating Paper (NDCP)

(1) In August 1979, the NDCP addressed the program objectives, risks, milestones, thresholds, costs, management, and support requirements.

(2) It further established the TARPS program (Program Element 63261N) as an Acquisition Category Three (ACAT III) program to be managed by the Naval Air Systems Command, Reconnaissance and Electronic Warfare System (REWS), Project Manager (PMA-253). A total of 48 TARPS systems were planned to support eleven squadrons (later changed to twelve) and two shore-based training sites. A detailed breakdown of system utilization is as follows:

11 (12)* squadrons	(3 each)	33	(36)*
2 shore sites	(3 flight, 2 ground each)	10	(10)
pipeline and attrition		5	(2)
total		48	(48)

(3) The CNO direction to emphasize adherence to IOC schedule increased the original limited production buy from eight to twelve systems, and finally to a twenty-four system procurement.

(4) The cost objectives and thresholds as defined in the NDCP are as follows:

ITEM	OBJECTIVE	ACTUAL	THRESHOLD
RDT&E	$24.50M	$26.00M	$27.60M
Pod Unit Cost	1.41M	n/c*	1.61M
A/C Mod Cost	.27M	.25M	.31M
Unit Program Cost	2.19M	n/c*	2.55M

*not complete - total cost data incomplete as production not finished.

(5) Included in the NDCP, the total system reliability requirements for Mean Time Between Failure (MTBF) were established as a goal of 12.0 hours and a threshold of 10.0 hours. Prior to the approval for full production, the actual TARPS testing reliability data was 14.3 hours based on 534 flight hours.

4. Program Guidance Changes

a. In October 1976, the development of the initial Naval Training Plan was initiated with the incorporation of the September 1976 RF14 platform guidance.

b. In January 1977, a CNO letter reserved the aircraft carrier organizational maintenance spaces for the future use of TARPS.

c. In March 1977, CNO informed the Atlantic and Pacific Fleet Commanders (CNO letter serial 506G2 1230916, 22 March 77) that the organization of the RF14 force had been examined in the light of fleet inputs and funding options. It established that single site basing (Naval Air Station Miramar, CA) for all RF14 would be with Light Photographic Squadron Sixty Three (VFP-63). This existing command was designated to provide all RF14 reconnaissance training and supply the fleet with deploying detachments.

d. In April 1977, the Naval Air Systems Command further defined the RF14 TARPS program. The TARPS pod was to be connected with an adaptor to the F14 Phoenix station 5 and would not be jettisonable. The existing F14 weapon system software, environmental control system, and rear cockpit displays would be modified to accept the TARPS system, but would retain full fighter capability. Conversion to full fighter capability was to be accomplished at organizational level (O-Level) maintenance in less than twelve hours.

e. On 15 April 1977 (message CNO 151716Z Apr 77), CNO approved the NAVAIR configuration proposal, established the funding level, and confirmed the RF14 homeport of Miramar, California.

f. In May 1977 (message COMOPTEVFOR 242150Z May 77), an

independent Navy testing community, Operational Test and Evaluation Force, strongly recommended the addition of a viewfinder system to the proposed F14/TARPS design development.

g. In August 1977, Program Office acquisition strategy was to produce eight TARPS systems under a limited production contract, and 40 systems under a full production effort.

h. In September 1977 (message CNO 231650Z Sep 77), CNO continued to modify the TARPS training organization. Fighter Squadron One Twenty Four (VF-124) as the established F14 fighter training squadron at NAS Miramar was tasked to provide the reconnaissance training for the fleet. The detachment concept of fleet deployment was expanded to a full squadron organization with an initial five squadrons to be in place in 1980. The phase-out of the RA5C and RF8 aircraft were contingent upon achievement of the planned TARPS force level activation schedule.

i. In October 1977 (message CNO 032226Z Oct 77), CNO directed the phase-out of the RA5C before the fleet introduction of TARPS and the extension of the RF8 aircraft until TARPS was deployed. The guidance reduced the scheduled number of TARPS squadrons in FY80 to two, and, more importantly, identified a planned tactical reconnaissance gap in fleet operational deployments. In addition, the guidance stated efforts would be made where feasible to accelerate the TARPS program and eliminate the gap.

j. In November 1977, a CNO letter to NAVAIR requested a detailed study of utilizing TARPS on the F18 aircraft to ensure TARPS was not developed for use solely on the F14. Funds were provided in January 1978 for the study, which concluded that major structural redesign would be necessary for TARPS carriage on the F18 aircraft. The report estimated a 15 month schedule delay in initial deployment with significantly increased development risks.

k. In August 1978, CNO guidance (memo OP-05 Ser 00/C500450 dated 29 Aug 1978) directed emphasis on the preservation of the TARPS IOC of April 1981. This emphasis required a change to the limited production strategy of an increase to a 24 systems procurement.

l. In January 1979, the engineering development models were assigned to VF-124 Miramar for training of maintenance and flight crew instructor personnel.

m. In May 1979, a redirection of the repair of several sensor electronic WRA's to utilize upgraded common carrier test equipment delayed the TARPS schedule. This delay necessitated long lead funding for full production material prior to test completion and prior to full production approval.

n. In July 1979, a new production requirement for 100 percent piece part parametric screening and subassembly environmental screening was imposed by the Navy on the TARPS production. After TARPS contractors

estimated an increase of 70 to 100 percent in production costs, NAVMAT waived the requirement in July 1980.

o. In October 1979, a program decision memorandum established the reconnaissance squadron force of nine fighters and three TARPS configured aircraft in each TARPS squadrons. A total of 49 F14 aircraft were built with TARPS capability.

p. In November 1979, Provisional Approval for Service Use (PASU) was granted to TARPS for a limited production procurement of 24 systems. Letter contracts for this procurement were initiated in December 1979 and were negotiated at a later date.

q. In February 1980, the Congressional Permanent Select Committee on Intelligence debated the need for the TARPS system and the requirement for a total of 48 systems. After two months of House and Senate debates, TARPS full funding of 48 systems was approved in the 1981 Congressional budget.

r. In November 1980, the TARPS I-Level repair facility on the USS AMERICA was validated and the final developmental testing (OPEVAL) was successfully completed. Based on those test results, long lead contracts were approved in January 1981 and full production was approved in March 1981.

s. In March 1981, EDM pods were transferred to VF-84 for

workup deployments in preparation for the first operational carrier deployment of TARPS. In July 1981, VF-84 received three production pods and the associated support package for USS NIMITZ deployment in August 1981.

III. PRODUCTION

A. General. With the approval of limited production in November 1979 and full production in March 1981, the Naval Avionics Center established a manufacturing schedule to meet the operational deployment schedule set by the Navy. The compressed schedule of eight squadrons deploying the first twelve months after IOC, was a success-oriented schedule and did not allow for delays. Throughout the initial production schedule, decisions on pod modifications and support development were considered with negative schedule impact the first concern. Numerous efforts to accelerate the production deliveries were made only to be set back to the original eighteen month delivery schedule because of unexpected vendor and subcontractor delays. The first TARPS pod was delivered eighteen months after November 1979 limited production approval and all squadron delivery schedules were completed prior to all deployments.

B. System Design

1. The production design of the TARPS system differed only slightly from that of the engineering development model. These minor modifications resulted from the final OPEVAL and first article test results and the resultant changes that occur in an extended production run where parts interchangeability is a requirement.

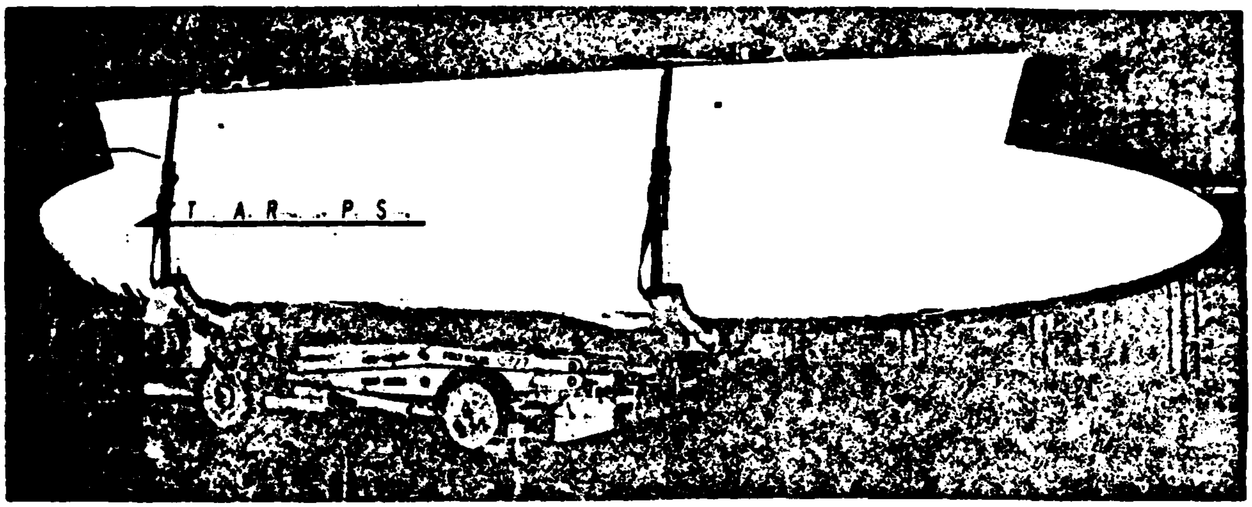


Figure 6. TARPS first production pod.

2. The TARPS configuration management was accomplished between NAC, the TARPS Program Office and NADC. A programmed NAC retrofit of pods to incorporate minor production changes in configuration was accomplished as the pods returned from deployment. This oppportunity for analysis of fleet deployed equipment confirmed existing maintainability and reliability design achievements.

3. During the first deployments of a production TARPS, one structural redesign was necessary to correct a material weakness caused in manufacturing. At near supersonic speeds at sea level, the nose cone area around the forward oblique window became deformed. A nose cone doubler was added to the window area which provided sufficient strength for a full aerodynamic performance envelope.

C. Logistic Support

1. Naval Avionics Center, as the TARPS production prime contractor, was responsible for interim support requirements. These responsibilities included logistics management, supply support, training, repair of repairables, configuration control and site activation plans.

2. Accompanying each pod delivery to a squadron, a support package was delivered consisting of spare parts necessary for the I-Level repair of all sensors and support equipments. The KS-87 sensor which was previously established as a fleet asset was not included in this support package. NAC's responsibilities in the logistic area will remain until the Navy supply system assumes control at the Navy material support date of November 1983.

3. Engineering Technical Services (ETS) have provided TARPS program support from the EDM testing into the production phase and fleet deployments. These services, provided by the Naval Aviation Engineering Service Unit (NAESU), have maintained the TARPS system through the numerous testing phases and provided for the on-the-job-training of fleet personnel. This support is available at each shore facility and deploys with each squadron during the carrier airwing training cycle.

IV. FLEET INTRODUCTION

A. General. Since the first carrier deployments of TAR°S (VF-84) in August 1981, the total system availability has been in excess of 90 percent. The overall flight crew and maintenance training with the F14 TARPS combination has provided the fleet with a highly responsive and high quality tactical reconnaissance platform and system.

3. Aircraft

1. The initial purchase of 49 TARPS-configured F14 aircraft for 1981 delivery was accomplished as part of an advanced attrition procurement. These aircraft were new, contained all of the configuration updates, and had substantially higher reliability than the original F14A aircraft. The minor modification for TARPS carriage when accomplished in the production line is of a minimum cost ($250,000 per aircraft).

2. The fleet loss rate to date of the TARPS capable aircraft has reduced the number of available platforms to 46 aircraft while the matching pod production of 48 systems will not be completed until August 1983.

C. Sensors

1. The sensor availability and performance in a fleet environment continues to exceed the design reliability by a significant amount. High quality tactical imagery is routinely achieved in the harsh environment of a carrier at sea.

2. The support of these high performance systems has proven to be achievable with a minimum of effort and significant improvement in product results over previously deployed reconnaissance systems.

3. The overall TARPS reliability and fault-finding capability of the I-Level test equipment has allowed a maximum of only three I-Level trained personnel to maintain all of the systems with an availability in excess of 90 percent.

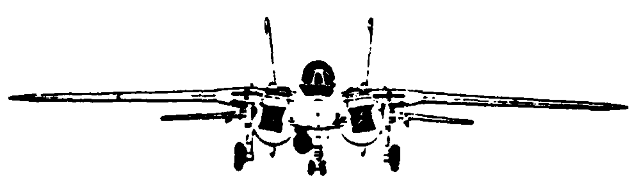
4. Although only four flight crews are formally trained in TARPS missions, all flight crews fly various reconnaissance missions. The minimum squadron training that is required by TARPS to operate the sensors safely provides a substantial flexibility in the assignment of crews to various missions. The continued exposure of these non-TARPS crews to the reconnaissance mission in a training environment will provide a fully-capable crew for a minimum of time and expense.

D. Future Development

1. The development of TARPS initiated in 1974 permitted the

retirement of the RA5C and RF8G systems. The initial TARPS development concept as an interim capability between the phaseout of the RA5C and the follow-on system has been extended into the late 1980s. The budget constraints to continue the development of a reconnaissance package of the F18 makes TARPS' life extension an even more attractive alternative.

2. If TARPS is going to address the needs of tactical reconnaissance in the late 1980s, a program of product improvement should be accomplished. Some design efforts, ground testing and even flight testing have been successfully completed or are in development stages for a new family of sensors. A very low altitude sensor (50 feet at 500 knots) has been evaluated with the addition of a cockpit displayed TV sensor and recorder. The modification of the KA-99 to provide a longer standoff lens has been proposed along with improvements to the AAD-5 cryogenic cooler system. These survivability and mission improvements total an R&D and production cost of 30 percent of the original TARPS procurement. Only the future requirements and budget pressures for tactical reconnaissance as a force multiplier will decide the direction of TARPS.



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GLOSSARY

ACAT III	Acquisition Category III
ASU	Approval for Service Use
BIS	Board of Inspection and Survey
BIT	Built-in-Test
CNO	Chief of Naval Operations
CTE	Contractor Test and Evaluation
DD/CCS	Data Display/Camera Control System
DOD	Department of Defense
DP	Development Proposal
DT-IV	Intermediate Level Maintenance Support
DT&E	Developmental Test and Evaluation
ECS	Environmental Control System
EDM	Engineering Design Model
ETS	Engineering Technical Services
GFE	Government Furnished Equipment
I-Level	Intermediate Level
ILSP	Integrated Logistic Support Plan
IOC	Initial Operational Capability
ITE	Integration Test and Evaluation
LORA	Level of Repair Analysis
MTBF	Mean Time Between Failure

NADC	Naval Air Development Center
NAS	Naval Air Station
NATC	Naval Air Test Center
NAVAIR	Naval Air Systems Command
NAVMAT	Chief of Naval Material
NDCP	Navy Decision Coordinating Paper
NDT	Navy Development Test
NTA	Navy Technical Assessment
NTP	Navy Training Plan
OFP	Operational Flight Program
O-Level	Organizational Level
OPEVAL	Operational Evaluation
OR	Operational Requirement
OT&E	Operational Test and Evaluation
OT-IIIA	Milestone IIIA
PHST	Packaging, Handling, Storage, and Transportation
PASU	Provisional Approval for Service Use
PMTC	Pacific Missile Test Center
REWS	Reconnaissance and Electronic Warfare Systems
SIT	System Integration Testing
SRA	Shop Replaceable Assemblies
TARPS	Tactical Air Reconnaissance Pod System
TECHEVAL	Technical Evaluation
T&E	Test and Evaluation
WRA	Weapons Replaceable Assemblies

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES
NATIONAL DEFENSE UNIVERSITY

MOBILIZATION STUDIES PROGRAM REPORT

INSTRUCTOR'S GUIDE TO TACTICAL AIR RECONNAISSANCE POD SYSTEM A CASE STUDY

by

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A RESEARCH REPORT SUBMITTED TO THE FACULTY
IN FULFILLMENT OF THE RESEARCH REQUIREMENT

RESEARCH SUPERVISOR: DR. B. WATERMAN

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

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TACTICAL AIR RECONNAISSANCE POD SYSTEM (TARPS)

INSTRUCTOR'S GUIDE

I. INTRODUCTION

A. History

1. The study of the TARPS procurement and its responses to numerous changes in program direction and emphasis provides an insight into the flexibility that is required in a program office management team. The development of TARPS occurred during the early 1970s when the defense budget was reduced from its previous levels and the costs for manpower were going up. This program as the replacement of the RA5C and RF8 aircraft did not command a high priority in the allocation of Navy tactical air funding resources. The TARPS system was approved as a low cost, minimum manpower, interim system replacement for a dedicated reconnaissance community of 2,000 personnel. Only a few objections, which were directed at the lesser capabilities of TARPS, were heard during the phase-out of the dedicated reconnaissance community. These few objections did not change the priorities of major Naval air program funding (F14, F18, EA6B). A student discussion of the timing of the fleet support of a new program, lacking in TARPS, would focus on the difficulties involved in the initial approval of any program.

2. The most significant factor in the timing of the phase-out of the RA5C and subsequent assignment of an urgent priority in the IOC schedule of TARPS was the logistic failure to procure long lead aircraft consumables necessary for RA5C carrier basing. The actual phase-out of the RA5C prior to the IOC of TARPS was the result of this logistic oversight and the subsequent lack of critical support items. The instructor should make the point that a "non-decision" is a decision and can effect the schedule or necessary priorities of a follow-on program.

II. RESEARCH AND DEVELOPMENT

A. Concept Validation Phase

1. System

a. The selection of the Naval Air Development Center for the initial design and fabrication of the TARPS research and development models was based on a minimum cost requirement and the available reconnaissance sensor engineering expertise. This decision to use an internal Navy lab for design and engineering support proved invaluable throughout the TARPS program. A selected core of NADC engineers and technical personnel supported the entire research and development program and the production article configuration management, and are subsequently providing a strong base for the development of the follow-on F18 reconnaissance platform now in the concept validation phase. The point should be emphasized that the continued support of internal service laboratories (normally more flexible and less expensive) in special mission areas provide industry support alternatives

b. The selection of the AAD-5 sensor for TARPS was based on system performance. The fact that the AAD-5 was in production provided

a significant cost reduction to the program but required additional management efforts between the U.S. Marine Corps and the U.S. Air Force. The Navy carrier based electromagnetic testing requirements for carrier equipments required an AAD-5 system configuration change from those of the Air Force or Marine Corps systems. In addition, the Navy was interested in the procurement of a newly developed, more efficient AAD-5 cryogenic cooler and receiver configuration which had been purchased by the West German Navy. The more efficient and cost effective cooler had not successfully completed the Navy qualification tests at the time of a long lead production decision milestone. The program office decison to purchase the West German AAD-5 receiver configuration with the original cryogenic cooler has built in an inexpensive product improvement capability for future TARPS engineering changes. However, this configuration difference has required the establishment of additional product controls in the combined services depot level repair facilities. The AAD-5 maintenance training course teaches both the Navy and Marine Corps systems and remains a combined effort at Marine Corps Station El Toro, California. This expanded information should be brought out in a student discussion of the pitfalls and values in using other in-service equipments in new platform installations. The planned product improvement should be discussed as an example of future system improvements that need extra funding in the beginning.

c. The use of the KS-87 from the active Navy and Marine Corps inventory saved substantial funds, but, created certain test and

evaluation problems. The fact that all KS-87 TARPS sensors were not new production sensors or were still in production, created a problem in responding to camera failures during the test and evaluation phase of the program. The TARPS systems overall reliability measurement was required to include the KS-87 data. However, no funding for KS-87 improvement was included in the program to resolve any sensor discrepancies. The fleet acceptance of a totally new TARPS system with a used sensor needed repeated procurement strategy explanation. The instructor should discuss the pitfalls of testing approved and in-service equipments as a part of a new procurement effort.

d. The selection of the Fairchild KA-99 as a sensor for TARPS was protested by the manufacturer of the Chicago Aerial KS-87. The program management's successful defense of this selection to the congressional inquiry delayed the development of the KA-99 by six months. The small marketplace in aerial cameras requires the program office to be able to justify these procurement decisions fully. A failure of any manufacturer to remain competitive in a small marketplace tends to result in more procurement protests. The congressional support of a decision protest may, depending on the timing, prove too difficult to overcome. The loss of time in the procurement process is a guarantee and the subsequent loss of service secretary or OSD support a possibility. The thirteen-month investigation of the Swedish "Star Baron" recce pod was in response to a congressional lobby effort to influence the Navy's procurement selection. It would be of value to have students aware of potential program delays in political and

industrial areas. The industrial and congressional pressure on a program office can be extremely high.

e. The Navy's procurement policy on the extensive use of Built-In-Test features of avionic equipments provided very high TARPS system availability during fleet operations. However, during the test and evaluation phase, the introduction of this BIT capability required the successful passage of the electromagnetic environment test requirements with the TARPS servicing doors open. The design of the Air Force AAD-5 system did not require this system qualification and therefore the AAD-5 failed the initial Navy tests. A two-phase modification effort was initiated on the AAD-5. Phase one was a minimum cost, minimum time effort which significantly improved the qualification data, but remained short of complete success. Subsequent fleet deployment data were collected on unmodified systems and phase one modified systems with no apparent difference or electromagnetic caused discrepancies. The design for phase two modifications was completed, but will not be incorporated until an actual fleet Built-In-Test system discrepancy is identified. The instructor should point out the need to satisfy the test requirements, as well as the value of holding the equipment change until an operational problem is identified.

2. Aircraft

a. The decision to change the TARPS platform from the A7 to the F14 aircraft was a Navy response to OSD program guidance. This

decision was based on the two issues of survivability and F14 procurement rates. The A7 combat performance in the high-speed-low-altitude environment of a reconnaissance profile was too slow. This shortfall in aircraft performance was identified in the results of the A7 concept validation flight tests. The F14 aircraft was the only supersonic aircraft that would be in the Navy inventory during the TARPS requirement timeframe.

b. The TARPS assigned urgent development schedule provided additional support for the Navy immediate procurement of a planned future buy to compensate for attrition of F14 aircraft. This provided continued efficient F14 production rates during 1978-80. The fact that TARPS aircraft were new procurements with the latest ECPs for reliability made the acceptance of TARPS significantly easier in the assignment to specific squadrons.

B. Engineering Development Model

1. Development

a. The redesign of the TARPS pod for the F14 aircraft required an increase of its structural strength for supersonic flight and a solid adapter mounting structure to reduce inflight vibrational levels. Numerous design tradeoffs were made to ensure the rapid installation and removal of the system for multimission conversion. The TARPS-demonstrated high system availability has developed a fleet

deployment pattern of leaving the pod on the aircraft for routine fighter assigned missions. A student discussion around the design trade-offs necessary in any multimission piece of equipment and its operational acceptance should be emphasized.

b. The unplanned requirement to assign the Naval Avionics Center to complete the remaining three of six EDM models provided an early positive base of technical experience in the fabrication of all 48 production systems. Because of budget constraints, only limited funds were allocated in manufacturing engineering and value engineering in the initial concept and EDM design of the TARPS system. This resulted in numerous minor ECP changes during the initial production run of 24 systems. The retention of the ECP approval authority in the program office for these minor changes is a requirement for minimum schedule delay, early production effectivity, and low retrofit costs. The use of different vendors for pod subsystem components between EDM and production systems surfaced some reliability problems not previously experienced in the EDM. The reliability and required spares data developed during your test and evaluation phase on the EDM models may not hold up with different subvendor contracts on the production article. The instructor should point out the value of a sole source material contract, once the testing has begun and your spare procurement is based on the test results.

2. Test and Evaluation

a. The test and evaluation effort is continuous throughout the procurement cycle. During the TARPS T&E phase, the Navy reorganized their emphasis on system reliability, parts screening and maintainability requirements. Although the TARPS development program was considered urgent in the adherence to the IOC schedule, all T&E requirements were accomplished with only one deviation. The scheduled deployments during the first eight months of production deliveries did not have a pod for indepth first article test. All subsystems received a complete first article evaluation, but the pod structure test was cancelled in order to meet the deployment schedules.

b. The fabrication of six EDM pods but only four complete sensor systems proved to be an an occasional test scheduling problem and was an absolute minimum necessary for on-schedule testing. The added expense of two additional sensor sytems would have improved the IOC schedule by five months and reduced the management of sensor assets to a reasonable effort level. The choice of concurrent testing for schedule improvement was not available with only limited systems assets. The instructor should review the trade-off in program management between schedule, costs, and the timing of equipment modification in response to required evaluations.

c. During the TARPS operational evaluation, several areas for F14 aircraft improvements were recommended. The modifications in these

areas were outside the TARPS program control and were not anticipated or funded in support of TARPS. The project management's smooth interface between the airframe program manager and the weapon system program manager for the successful completion of a mutual program cannot be overstated.

3. Manpower

a. The establishment of a small number of additional reconnaissance manpower to an existing F14 squadron was based on the growing fleet manpower shortage in the late 1970s. There remain today several unresolved personnel policy problems in this concept of TARPS operation. The various designated TARPS commands have been given an additional primary mission of reconnaissance, eighteen additional personnel and three TARPS systems, but have not been allowed to reduce any other areas of the fighter mission. The second F14 squadron in an airwing is measured with identical performance indices aganist the TARPS squadron but does not have the burden of a second primary mission. This issue of competitive scoring and multimission flight crew qualifications remains a problem in the incentive a TARPS squadron receives for accelerating its reconnaissance performance.

b. The determination of the required eighteen TARPS maintenance personnel as a minimum number did not take into consideration the Navy-wide reduced personnel fill rate because of cyclic shortages in certain high-tech rates. Squadrons continue to

deploy with sometimes less than eighteen additional TARPS personnel. The high system availability has minimized the effect of this shortfall in actual manning. However, a manpower review should establish actual 100 percent manning priorities in critical skill areas. The important points of future planning of manpower as a program manager responsibility should be made by the instructor at this point in the discussion of the case study.

4. Training

a. The addition of one fleet squadron to the original total of commands without increasing the total number of pods required the efficient use of the EDM assets. These EDM pods have been upgraded to production configuration and are now being utilized in a no-fly maintenance training environment. This decision released two production pods for use as attrition or additional squadron assets.

b. The final selection to incorporate the reconnaissance training in the fighter training squadron (VF-124) proved to be both a benefit and a problem. The initial organization for the reconnaissance training of fighter flight crews was made up of RA5C-experienced reconnaissance crews. Without their expertise, this training would not have been established as smoothly or efficiently. The problem resulted in the difficulty of a mid-ranked, non-fighter experienced, ex-RA5C flight crew to remain competitive for promotion and command in a previously all-fighter community. Only after several years has the

reconnaissance training been taken over by fighter personnel and the problem no longer exists.

III. PRODUCTION

A. General

1. The congressional discussion by the Permanent Select Committee on Intelligence on the necessity for the TARPS second buy of twenty-four systems was politically initiated. A single staff member of the House committee who expressed a desire for a more capable system felt that the reduction of the total number of "interim systems" would hasten the Navy's delayed decision for a follow-on platform. In addition, the same committee in the Senate was evaluating and recommending disapproval of a favored program of this staff individual. The joint committee to resolve recommended program cuts finally approved the budget for the second buy of TARPS, which had received a favorable comment from the previous year's committees for the efficient multimission use of the F14 aircraft. This potential reduction in the TARPS program illustrates for the student, the congressional power over a procurement effort that has nothing to do with the value or success of a program, but is only a political instrument.

2. The pressing schedule of fleet deployments and the close delivery of production TARPS systems delayed the first article test schedule. The delayed results of this test allowed some pod deployments

without all approved changes to specific system configurations. This proved not to be a significant problem in fleet deployments because of the dedicated TARPS engineering support on the first deployments. All TARPS systems were upgraded to a single configuration upon return from initial deployment. This point illustrates another area where schedule requirements demanded priority over normal configuration management practices.

B. Logistic Support

1. The management of initial spares for deployments was accomplished by the Naval Avionics Center. On carrier deployments as well as at the training bases, F14 Grumman representatives are responsible for all TARPS material control and equipment transfers. Each deployed unit has a complete spare sensor system and expedited material will be sent from the closest shore training site or from the Naval Avionics Center supply control. The close control of the initial spare parts, and the expedited repair material are an absolute necessity during fleet initial system introduction. The student should understand that the program office resolution of supplying unexpected high usage items must be flexible and responsive to the immediate funding and procurement of these items. In many cases, the fleet support takes priority over production requirements.

2. The management of any new system's publications, manuals, checklists, and instructions is neither simple, cheap nor ever

completed. Any change to the pods, sensors or intermediate-level repair procedures will change at least 70 percent of all TARPS manuals. The use of informal message changes to manuals while waiting to fund and produce one large manual change will ensure the fleet is operating with only a portion of what is current material. Deployment with these limited publications for fleet operation reduces the possibility for a successful first deployment. Without final publications, the fleet must have special provisions for system maintenance expertise. A good initial system deployment establishes a strong reputation and will ease the fleet's acceptance and usage of any system.

IV. FLEET INTRODUCTION

A. General

1. The TARPS system's successful introduction to the fleet has been initially shown and its progress is continuing, but not assured. The initial success is the result of attention in a few specific areas. The validation model and the use of the EDM pods in a training environment resulted in 1500 flight hours' experience on the proposed system prior to the final production design and approval. The actual production system was the third evolution in development and the present fleet TARPS system is the fourth improvement change in configuration.

2. The emphasis by experienced reconnaissance personnel on reliability and ease of servicing created a system with high availability, which eased the critical fleet acceptance of TARPS as a new but limited reconnaissance capability.

3. The use of RA5C/RF8 reconnaissance-experienced personnel in key positions in the test and evaluation phases, development engineering, program management and fleet training aided significantly in the effective program start-up. The instructor should initiate a discussion of the value of dedicated recent fleet-experienced program managers

balanced against the acquisition-experienced program manager.

4. The fact that the reconnaissance mission profile is one of low altitude and high speed flight and the mission results in a target photograph makes the mission a challenge and enjoyable to fly. This flight profile is exactly opposite that of the fighter mission and provides some challenge and uniqueness in the assignment. All flight crews fly TARPS missions, and yet not all crews receive formal TARPS training. This remains a community training problem. The routine use of TARPS on the aircraft and the designed ease of system operation reduce the detrimental effect of limited training, but will require continued in-house training emphasis. An attempt to require all F14 crews to obtain TARPS training failed because of increased cost in formal training flight hours.

5. The introduction of the entire Navy reconnaissance community into the fighter community as an additional mission was not the least of the challenges of the TARPS program office. After several very successful initial fleet deployments, TARPS only then began to be accepted as a responsibility worthy of the squadron's best efforts. Future reconnaissance assets should be more easily transitioned into the support of the attack community.

6. The lack of a reconnaissance wing concept for total east and west coast F14/TARPS management may prove to be the largest problem in maintaining a single Navy approach to the reconnaissance mission. A

focused effort on the reconnaissance mission is complicated more by the lack of common F14 fighter organization on both coasts. Several of the previous points in the operational introduction of TARPS should be used by the instructor to illustrate the requirement for the program manager to be involved in all aspects of the development and introduction of nis system's hardware.

B. Future Development. An improvement in the TARPS sensors has continually been attempted by obtaining a budget priority for TARPS aircraft mission survivability improvements. This effort has met with only limited success as the large share of a small package of reconnaissance funding resources has been directed towards a follow-on F18 reconnaissance package. The TARPS systems will be the fleet's only tactical reconnaissance asset until the late 1980s. The follow-on program plans are to use some of the TARPS sensors for the new platform and will have to address some of the same TARPS program pitfalls. TARPS survived the procurement process because of a few individuals' dedication to the mission of tactical reconnaissance.

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